

# Preface

## Audience

This book is designed to accompany a final year undergraduate or masters level course in *pervasive computing*, although it could serve well as a course for introducing sensors or experiment design to students in earlier years at university with some skimming over the research focus; or equally as a getting-started guide for PhD level students tackling pervasive computing, in particular programming sensors and context awareness, for the first time.

## Book Approach and Structure

This book is about sensing and systems issues in pervasive computing. The reader may also be interested in the HCI issues, programming for Java J2ME, iOS, or Android—each of which would require a separate book; similarly for issues in wireless networks, sensor networks, embedded systems design etc we give an introductory coverage but other books should be consulted for deeper understanding of these topics. The approach of the book organises into three main parts and some supporting material: First we have an introductory chapter, introducing some of the issues and ideas and a discussion of experimental practise. In Part II we discuss some of the challenges raised by pervasive computing—in the limitations and variation of hardware and networks; and some of the tools being applied in pervasive computing—sensor devices, PDAs and mobile phones, wireless networks. In Part III we tackle the core issue of the book—that of sensing the world around our computing devices and making sense of it.

All chapters are supported by suggested readings of the literature, and most have laboratory exercises (often involving the Phidgets sensor system). The more advanced reader is encouraged to follow the references and suggested readings in more detail, to supplement the more general discussions with additional technical detail. The course assumes some basic knowledge of programming, networks and experiment design. We do not propose to teach programming, networks or electronics

in this book—there are too many good books on these topics already; however a reminder of the issues in experiment design is provided in Chap. 2.

## Example Course Outline

To follow the whole book in all its detail would make for quite a substantial course, but of course selections can be made. For instance:

- For a lower level course, omit most of the readings of research literature.
- Where Phidgets are not available, omit some of the more practical sections in Part III and re-work with design exercises or adapt to other tool-kits, e.g. Arduino.
- For a course which focuses less on particular issues in sensing or has less mathematically advanced students, omit or reduce the coverage of Chaps. 6 and 8.
- For a course more concerned with sensors than pervasive computing per-se, omit or reduce the coverage of chapters in Part II.

## *Aims, Learning Outcomes and Syllabus*

The book expands around the notes developed while teaching a 3rd year and masters level course at the University of Sussex. The course had the following specification, which might be adapted in using this text to develop new courses:

The “pervasive computing” course aims to provide an understanding of the issues, technologies and concepts underlying the vision of pervasive computing, particularly in wireless networks, context-awareness, sensors and programming for limited and mobile devices. The course also provides experience of scientific and engineering techniques of design, experimentation, writing and critical review of literature. This is achieved through a combination of lectures on basic concepts and theory, seminars discussing literature and design, lab exercises in implementing systems with these technologies, and independent study building on this class work.

By the end of the course, a successful student should be able to:

- Categorise, describe and relate concepts in mobile and ad-hoc networks, context awareness, and programming of devices in pervasive computing environments—and make a critical review of work in the research literature which engages those concepts.
- Analyse theories and existing solutions, and design implementations and extensions to these, to solve problems in mobile and ad-hoc networks; context awareness; and programming of devices in pervasive computing environments.
- Undertake the design, running and reporting of experiments with sensors and mobile devices.

Outline syllabus:

- Research and practise in context awareness

- Interfacing to sensors
- Classification of context and uses of context
- Resource discovery and system configuration
- Location aware computing—sensing, modelling, representing and using location information
- Concepts in mobile and ad-hoc networks
  - Principles in wireless communications
  - Addressing and routing in the mobile Internet
  - Identity and routing in ad-hoc networks
  - Identity, routing and in-network processing in sensor networks
- Design of pervasive computing systems
  - Programming with memory, CPU and power limitations for mobile devices and sensors
  - Responding to context and resources: exceptions, errors and recovery
- Design and reporting of experiments
  - Examining the literature related to the above
  - Research and engineering questions
  - Running experiments and reporting results

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Engineering Context Aware Systems

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